

**ALVIN COMMUNITY COLLEGE
DIAGNOSTIC CARDIOVASCULAR SONOGRAPHY**

**SONOGRAPHIC INSTRUMENTATION
SYLLABUS
DASE 1318.60**

**INSTRUCTORS: Jessica L. Murphy, BS, RR -NPST, RDCS, RVT
Section 01
And Dina DuBose, BAT, RVT, RVS, CCT
Section 60**

SPRING 2015

TENTATIVE CLASS/LAB SCHEDULE

WEEK	DATE	TOPIC	READINGS	LAB ACTIVITIES
1	01/22	Review Syllabus	Edelman pp1-112	The 6 Ps
		Begin Unit 1 Waves		Instrumentation
		Review Math Concepts		
2	01/29	US Physics - Basic Principles		Knobology
		Attenuation and Pulsed Waves		Map #1 (Ch. 1-3) due
3	02/05	Unit 1 (cont.)	Handouts for Lab	Knobology
				Map #2 (Ch.4-5) due
4	02/12	Unit 1 (cont.)	Finish chapters	Experiments: Depth, Frequency, TGC, Compress, Power, Gain, PRF
				Map #3 (Ch.6-7) due
5	02/19	Unit 1 Exam / Begin Unit 2	Edelman pp113-284	Review Midterm Lab Practical
				No Mind Map today
6	02/26	Unit 2 Resolution Transducer Construction Sound Beam Anatomy		Experiments: Frame Rate, 2D optimization, Dynamic Range, Smoothing, Post- Processing
				Map #4 (Ch. 8-9)due
7	03/05	Unit 2 – Resolution, Display Modes 2D imaging, Real time		Experiments: XDCR type, Harmonics, Fundamental
				Map #5 (Ch.10-13) due
8	03/12	Unit 2 –Pulse Echo Instrumentation System operation and Display		Midterm Lab Practical
				Map #6 (Ch. 14-17) due
	03/19	SPRING BREAK – NO CLASSES!		
9	03/26	Unit 2 Exam – Begin Unit 3		Doppler and Color Controls
		Doppler	Edelman pp285-354	No Map Due
10	04/02	Unit 3 Doppler (Review Hemodynamics Independently)		Doppler and Color Optimization Map #7 (Ch. 18-19) due
11	04/09	Unit 3 – Doppler Optimizing Doppler		Doppler and color artifacts Map #8 (Ch. 20) due
12	04/16	Unit 3 - Contrast		Present Phantoms during lab
13	04/23	Unit 3 Exam – Begin Unit 4	Edelman pp355-552	Artifact lab
		Artifacts and QA		No Map due
14	04/30	Unit 4 – Artifacts		Final Lab Practical
				Map #9 (Ch.21-22) due
15	05/07	QA, Bioeffects, Safety		QA Lab Map #10 (Ch. 23-24) due
		This last map is a free map...you can choose how you do it.		
		Prepare for SPI, Take it over the break!		
16	05/14	Unit 4 Exam F/B Exam		QA Lab completion
		Yes, both exams on same day unless we finish early enough to move it up. Let’s hope we can!		
		This is a tentative schedule & is subject to change at the instructors’ discretion. Additional readings for which student is responsible: all appendices, tables & and charts in both books. Edelman and Kremkau are optional resources.		

Instructor: Jessica Murphy, BS, RRT-NPS, RDCS, RCCS, RVT, CCT and
Dina DuBose, BAT, CCT, RVT, RVS
Email: jmurphy@alvincollege.edu ddubose@alvincollege.edu
Phone: 281-756-5650 281 756 5663
Office hours: S108D (see schedule posted on the door) S148 - By appointment only

Course Information:

Days: Thursdays

Time: .01 section 8:30 am -12:20pm and .60 section 5 pm – 8:50 pm

Dates: Jan. 22 – May 14

Location: S109 .01 section and S143 .60 section

COMMUNICATING WITH YOUR INSTRUCTOR

The preferred method for communicating with your instructor is through the ACC email. You may also call the office. Please leave your first and last name, a phone number or e-mail where I can contact you. I will normally respond within 24 hours Monday-Thursday and by the next business day on Friday-Sunday.

COURSE DESCRIPTION

This course provides an introduction to ultrasound principles and instrumentation, including properties of ultrasound, interaction of ultrasound with tissue, transducers, Doppler, instrumentation, image display, artifacts, QA, bioeffects and ultrasound safety.

PREREQUISITES

Acceptance into DCVS Program or approval to audit from Program Director.

RATIONALE

The student should have a basic understanding of ultrasound systems and the physics concepts behind them to be able to obtain diagnostic images, correct artifacts, optimize images, and utilize instrumentation appropriately. This is an applied physics course. You will take the concepts you learn back to the equipment and apply it to the instrumentation.

INSTRUCTIONAL METHODS

US physics consists of four (4) hours of instruction-per-week, over sixteen (16) weeks. This time is divided into lecture and lab components. The lectures will be supplemented with slides, overheads and video presentations when necessary. The lab portions will include demonstrations, exercises, and hands-on practice. At times, there may be equipment demos from various reps.

COURSE OUTLINE

- Unit 1 - Basic Ultrasound Physics
- Unit 2 - Transducers
- Unit 3 - Pulsed Doppler, Image and Display
- Unit 4 - QA, Bioeffects, Artifacts, Safety

TEXTBOOK INFORMATION

For current information on the textbook and other course materials, visit the [ACC College Store](#) website.

Required Textbook:

Edelman, S. Understanding Ultrasound Physics, Fundamentals and Exam Review. 5th Ed.

ISBN 0-9626444-5-5

Additional References:

Miele, F. Essentials of Ultrasound Physics The Board Review Book. 2008 ISBN 987654321

Kremkau, F. Sonography Principles and Instruments. ISBN 978-1-4377-0980-3

ADDITIONAL MATERIALS

- USB/ Jump Drive or CD R/W
- Scantron exam answer sheets
- Colored markers
- Paper clips, scotch tape, scissors, stapler and staples
- Ream of printer paper, ink cartridges for lab printer
- Sketch pad for mind maps

CLASSROOM/ LAB ETTIQUITE

It is the right of each student to participate in his or her learning, and it is the responsibility of each student to not interfere with the learning of other students. Keep fellow students' and volunteers' medical information protected. When scanning Do NOT delete other student's studies. Only delete your OWN. If more studies need to be deleted ask the instructor. Computers, tablets, and cell phones are ONLY allowed to be used in class for school purposes such as taking notes or following along on Blackboard. You may not record or photograph your instructor or fellow classmates without written consent. Recordings and photos may not be posted to the internet due to privacy and HIPAA regulations regarding our area of practice. Go to S108 for permission form. Policies governing the classroom will be provided in the ACC student Handbook and students who repeatedly violate one or more of these policies will be subject to disciplinary action.

This information is published in the ACC Student Handbook

http://www.alvincollege.edu/resources/pdfs/student_handbook.pdf

ACADEMIC SUCCESS AND SUPPORT SERVICES

Americans with Disabilities Act

ACC complies with ADA and 504 Federal guidelines by affording equal access to individuals who are seeking an education. Students who have a disability and would like classroom accommodations must register with the Office of Disability Services, A 136,(281)756-3533. Instructors are not able to provide accommodations until the proper process has been followed.

BEHAVIORAL INTERVENTION TEAM (BIT) – LETTING SOMEONE KNOW

The Behavioral Intervention Team (BIT) at Alvin Community College is committed to improving community safety. College faculty, staff, students and community members may communicate safety concerns to the BIT team by email, bitcore@alvincollege.edu or through an electronic reporting option located on the [BIT page](#) of the college website.

ACC LEARNING LAB

The **ACC Library** is an excellent source for research and writing help. Quiet rooms are available for studying and doing class work. For more information, visit the [ACC Library Website](#) or call 281-756-3559.

The **ACC Tutoring/Learning Lab**, located upstairs in building A, provides students with a variety of services including tutoring (math, writing, and other disciplines); computers and printers; a testing facility; and tables/carrels. Call 281-756-3566 or visit the [ACC Tutoring/Learning Lab Website](#) for more information.

MyBlackboard

Support for **MYBlackboard** can be obtained by completing the [Online Support Form](#).

WEBACCESS, Passwords or ACC Computer Lab Information- [Help Desk Website](#) or contact the IT Dept. Help Desk at 281-756-3544.

CODE OF ACADEMIC INTEGRITY AND HONESTY

Alvin Community College students are members of an institution dedicated to the pursuit of knowledge through a formalized program of instruction and learning. At the heart of this endeavor, lie the core values of academic integrity which include honesty, truth, and freedom from lies and fraud. Because personal integrity is important in all aspects of life, students at Alvin Community College are expected to conduct themselves with honesty and integrity both in and out of the classroom. Incidents of academic dishonesty will not be tolerated and students guilty of such conduct are subject to severe disciplinary measures.

DISCLAIMER

The instructor reserves the right to modify this syllabus as needed and will notify the students of any changes using the ACC e-mail or MyBlackboard e-mail or announcements.

EXAMS

An exam will be given at the end of each unit. The exams will be averaged with the homework/quiz average to calculate the final grade. **Any missed exams will be made up on the next class day, or sooner by appointment! THERE WILL BE NO EXCEPTIONS!**

The final exam may be used to replace the lowest exam grade as long as the student has not missed more than one (1) exam. If a student misses a second (2nd) scheduled exam, the final will be used to replace that grade. Any missed exam after the second (2nd) one will result in a zero (0).

To deter students from missing their physics exams, 5 points will be deducted from the exam grade if absent on test day without a written legitimate excuse note and a call to the instructor.

ATTENDANCE

Each student is expected to attend class regularly. It is the student's responsibility to make up any assignments that are missed. Please call or email the instructor if you are absent, to make arrangements for missed notes, assignments, handouts and/or tests. Also, it is a good idea to call a classmate to get a copy of the notes. You may bring a recorder to class and share recordings with each other in times of absence.

1. If a student misses more than four (4) classes, they may be dropped.
2. Students must attend class and lab regularly to receive credit.
3. Lab absences will count as one (1) absence - even if you are present for class.
4. Tardies greater than 20-minutes will count as an absence.

Vitally important information is presented each day in class and lab. *Physics is NOT one of those subjects you can miss and get it later. Please be in attendance at all times unless you are ill.*

MIND MAPS

Mind Maps may be given or assigned at any time during the course and will be announced in advance. There is usually mind map due each class day except on major exam days. The lowest mind map grade will be dropped prior to calculating the homework average. If a student misses a map **it may NOT be made up**. Please email mind map if you are going to be absent.

WEEKLY MIND MAPS

Mind maps may be done weekly over reading assignments and are due at the beginning of each class day (when not having a test – no mind maps are due on test day).

The mind map will be graded using the following criteria: Total possible -100 points

30 points – complete, all info included, each chapter done

20 points – used different colors, neatly created

20 points – used a visual graphic to convey information

15 points – creative and imaginative.

15 points – oral presentation

Grade of Zero if absent

Grade of 75 if emailed to instructor

Written part of Mind Map

Required information - definition, formula, units, typical value, can it be changed? By what button? By what is it determined? What is the significance for the sonographer or patient? Aha! moments, questions about what you don't understand.

Do not turn in linear notes and flow charts. Mind Maps are not accepted late.

Oral Presentation part of Mind Map

Be prepared to discuss your mind map with the class. Explain your overall concept, tell us your Aha! moment, ask your questions, be prepared to answer faculty questions.

If you are unsure of what or how to complete a mind map, you may look up "Mind Mapping" on the internet. There are many valuable sites that explain the process.

Quizzes

Quizzes may be given at any time. They will be announced in advance. Quizzes cannot be made up if missed. The lowest quiz grade will be dropped before calculating the final average.

ASSIGNMENTS

Other assignments and homework may be given periodically throughout the course. Due dates will be assigned at that time. These grades will be averaged together with mind maps and quizzes if any are given and used as a test grade in calculating the final grade. 5 points will be deducted from homework for each class date it is late.

METHOD OF EVALUATION

Student evaluation is based on completion of unit examinations, homework assignments, attendance, and class/lab participation. The average is calculated by averaging unit exams and the hmwk/quiz average. Remember the lowest quiz/map grade will be dropped and the final exam may replace the lowest exam grade if the student has not missed more than one scheduled exam.

STUDENTS MUST MAKE A 77 OR BETTER TO RECEIVE CREDIT FOR THIS COURSE!

Grading System

A = 91 - 100

B = 82 - 90

C = 77 - 81

F = Below 77

GRADES:

Record Weekly Grades Here

Mind Map 1	_____	Mind Map 4	_____	Mind Map 7	_____
Mind Map 2	_____	Mind Map 5	_____	Mind Map 8	_____
Mind Map 3	_____	Mind Map 6	_____	Mind Map 9-10	_____

Record Major Grades below:

Major Grades	Grade
<i>Assignment Average</i>	
<i>Unit 1 Exam</i>	
<i>Unit 2 Exam</i>	
<i>Unit 3 Exam</i>	
<i>Unit 4 Exam</i>	
<i>Final (to replace lowest test grade if**)</i>	
<i>LP1 _____ LP2 _____ Lab Practical Average</i>	
<i>Project – US Phantom</i>	
<i>Total</i>	
<i>Average</i>	

The final course grade is calculated by averaging all of the major grades: homework/quiz average, phantom project, lab practical average, and each of the unit exams.

Always notify your instructor if you are concerned with your grades or your status in the class. **It is the students' responsibility to keep up with their grades and course averages.** The instructor is available as needed for extra help or to discuss grades. Do not wait until the end of the semester to address any problems.

Keep track of your grades. Do not throw away any of your labs until the semester is over. If you notice a problem, contact your instructor. Do not let your grades get out of hand.

BONUS POINTS

Bonus points, up to two (2) per class, may be added to the final average.

1. Students can model for one (1) bonus point.
2. Students may attend local in-services and society meetings for one (1) bonus point each.
3. Any additional bonus point activity as announced by the instructor.
4. Bonus points may also be used as a homework pass. Homework passes are only good for one assignment per course per semester. They are NOT allowed to be used to clinical assignments or any form of scanning assignment.

MODELS

The Diagnostic Cardiovascular Sonography Program is in need of models/volunteers each class for the hands-on practice. If you, a family member, or friend would like to model, please let the instructor know so a volunteer schedule can be made in advance whenever possible, and to ensure an adequate number of models for each lab. Participants need to call 281/756-5625 for an appointment. When models are not available, students will scan each other.

Additional Information

Badges You will need to get an ACC student badge. Take your paid tuition receipt to the Library.

Parking You are **required** to have an ACC student parking permit. Go to the campus police department in H-Building. You will need:

1. Texas Drivers License
2. License Plate Number
3. Year, Make and Model of Vehicle

Do not park in the white striped parking spots and do not back into a parking spot. The white stripes designate Faculty/Employee parking. Violators' vehicles may be towed!

Course Competencies - Upon completion of this course, the student will be able to:

1. Demonstrate understanding of ultrasound physics, principles of instrumentation including ultrasound propagation properties, interaction of ultrasound with tissue, transducers, Doppler, image display, artifacts, bioeffects, QA, and safety.
*(F1, F2, F3, F4, F5, C15, F12)
2. Apply knowledge to image acquisition, optimization, and artifact recognition.
*(F7, F8, C1, C9, C7, C16, C17)
3. Select and use appropriate transducer on software application to tasks.
*(F13, C5, C8, C18, C19)
4. Optimize 2d, M-Mode, and Doppler appearance using appropriate controls.
*(F9, F10, C8, C16, C20)
5. Follow guideline and use ultrasound safely, and in an appropriate manner.
(F11, F12, F13, F16, C6)

2 LAB PRACTICALS: One Major Grade

Students will be tested on their knowledge of the equipment in the lab by:

1. Finding each control quickly
2. Demonstrating how or explain why it is used
3. State what it does and the initial setting

The student will be tested twice (mid-term and final) with the instructor present and it will count as one exam grade. If the student fails the practical, it will be repeated for a lower grade on each repeat. If you pass on the first try you can make an A (91-100), on the second try you can make a B (85-90), and so on.

Lab Practical Grading Rubric

-1 slow in finding control but able to locate within 5 seconds.

-1 could not state function of control or how to set it

-5 could not find control

Any grade below 85 must be repeated.

See attached evaluation form.

COURSE COMPLETION REQUIREMENTS

1. Attend class and lab and have no more than 4 absences
2. Turn in all assignments, including weekly mind maps; take each unit exam and the final
3. Pass the mid-term and final lab practical
4. Make at least a 77 on the final average
5. Complete the project and participate as a member of a team

DSAE 1318: ULTRASOUND PHANTOM PROJECT

Class Group Project: Homemade Ultrasound Phantom

Form 2 groups with equal team members. Look up the recipe or create your own, for making a homemade ultrasound phantom. Follow the recipe and place interesting objects into the phantom to be scanned. Experiment with different recipes, containers, and objects to find something that works well. Use solid objects, hollow objects, and fluid filled objects; be creative. Once prepared, the members of the other teams will have to scan the phantom, locating each of the objects and trying to guess what it inside. The designing team must make a map (answer key) for comparison of results. Phantoms will be on display for fellow students to scan and try to determine what types of objects are placed in each other's' phantoms. The team identifying the most correct objects will win a special prize. Each group will then give a short presentation about how the phantom was made, what role each student played, and the physics concepts learned in the process. You should use a poster board and or power point to illustrate the steps and concepts.

This will be considered a major project grade. This usually helps the students' final course average IF you do a good job. Spend time on it. You most likely will need it in this course to boost your grade. Also, HAVE FUN with it.

Specific Instructions

The purpose of this project is for students to gain a better understanding of ultrasound physics by completing research that will increase understanding of how an ultrasound phantom is created, and the imaging physics or acoustic properties of different objects. Students will form groups. Each student in the group will have a designated responsibility. The students will present their phantom with the required information to the class. A poster or other visual aide should be included which details the required information. The project information/materials should include, but is not limited to the following:

- The ultrasound scanning phantom with imbedded objects of differing acoustic properties. (research different recipes on the internet or do experiments to create your own) Be creative in what you prepare. Presentation, creativity and variety counts.
- A key to the item and location of objects in the phantom. (give the best estimate of the size, distance from edges, and depth of each object) Keep the key a secret until the other teams have the opportunity to scan your phantom and try to guess what is inside.
- List of team members' duties and specific roles or assignments.
- Visual aide explaining the physics of ultrasound at work in your specific phantom with terminology defined.
- Recipe used, listing all ingredients, including quantity.
- Directions that were followed on how the phantom was created and how it should be scanned.
- References listed

The phantoms will be placed on display in the lab on the specified due date. Each team will take turns scanning the other team's phantom. The team will print images from the phantom with the items "identified". The mapped images will be compared to the key to determine if the unknowns were correctly identified and located. Once the maps and keys are compared, each team will have the opportunity to present the process and results orally to the group. The phantom projects will then be judged for creativity, attention to detail, and the accurateness of the information presented. Please let your creative juices flow and take pride in this project. Additional (non-ultrasound related) judges may come through to critique the projects and will count towards 25% of the overall grade.

Please see Phantom Project grading rubric below

Assignment: DSAE 1318 Phantom Project Team Name: _____

Objective/Criteria	Performance Indicators		POINTS
	Needs Improvement	Meets Expectations	
Information Research	(<25 points) Information missing or not covered	(25 points) Thoroughly and accurately covered roles, recipe, and concepts learned, physics properties of phantom including tissue characteristics of objects and artifacts created.	
Presentation	(<25points) Presentation was confusing or AV media was not of highest quality	(25 points) Clear and concise. The project /AV media neat and legible. Orally presented as a group.	
Creativity	(<25 points) Project was not interesting. Visual aids did not contribute to the understanding of the material.	(25points) The visual aids contributed to the understanding of the material. The project was "fun" to look at. The phantom held together and was interesting and easy to scan.	
Phantom	(<25 points) Overall quality of the project, with 0 being the lowest score	(25 points) The overall quality of the phantom: recipe, construction, objects, artifacts, key and scanned images.	
Bonus points	No objects guessed in another phantom	# Bonus points = the number of items correctly guessed in the other team's phantoms.	
		Total Points Out of 100	

Team Members:

Overall Grade - _____

The winning team will have 5 points added to the exam of their choice. ☺

UNIT I OBJECTIVES

Students must gain a basic understanding of physical units, scientific notation, engineering notation, common units, and the metric system, as well as the basic properties of sound.

Upon completion of this unit, the student will be able to:

1. define sound and ultrasound.
2. list and define acoustic variable.
3. list and define parameters used to describe sound.
4. identify the units, what determines it, values, if it can be changed by the operator.
5. list and define descriptors of pulsed ***and*** continuous ultrasound.
6. describe propagation of ultrasound through tissue.
7. discern between an ultrasound wave, pulse and continuous waves.

Key Words - Know Definition as it Relates to Ultrasound including: definition, formula, units, typical value, what determines it, can it be changed, how it is changed, significance.

Sound	Pulse
Ultrasound	Pulse Repetition Period
Compression	Pulse Repetition Frequency
Rarefaction	Spatial Pulse Length
Pressure	Pulse Duration
Density	Duty Factor
Temperature	Decibels
Distance	Attenuation
Transverse Wave	Absorption
Longitudinal Wave	Reflection
Period	Scattering
Frequency	Rayleigh Scattering
Amplitude	Half Value Layer Thickness
Power	Impedance
Intensity	Scatter
Propagation	Back Scatter
Speed	Acute Angle
Wavelength	Obtuse Angle
Hertz	Intensity Reflection Coefficient
Cycles	Intensity Transmission Coefficient
Bulk Modulus	Reflection Angle
Phase Difference	Incident Angle
Constructive Interference	Snell's Law
Destructive Interference	Refraction
Medium	Range Equation
LARRD Resolution	

Students may turn in **TYPED** definitions for extra credit assignment.

Please do your own work. Definitions must be complete in order to count as extra credit. Unit 1

Assignment – Mind Map each chapter due for a grade in the class, as instructed

UNIT II OBJECTIVES

Upon completion of this unit, the student will be able to:

1. define the components of a transducer and the piezoelectric effect.
2. understand bandwidth and quality factor.
3. know what determines frequency.
4. illustrate the anatomy of a sound beam.
5. define terms that describe sound beams and their properties.
6. know how beams are focused.
7. list and define display modes.
8. list and define types of transducers.
9. understand temporal resolution.

Key Words - Know Definition as it Relates to Ultrasound including: definition, formula, units, typical value, what determines it, can it be changed, how is it changed, significance.

PZT	A ModeC Mode
Matching Layer	B Mode
Damping Element	M Mode
Bandwidth	B Scan
Resonant Frequency	Mechanical Scan Head
Quality Factor	Array
Continuous Wave	Linear
Pulsed Wave	Annular
Sound Beam	Curvilinear
Focus	Switched
Focal Length	Phased
Focal Zone	Water Path
Near Field (Freznel)	Vector Array
Far Field (Fraunhofer)	Duplex
Divergence	Real Time
Diffraction	Temporal Resolution
Huygen's Principle	Line Density
LATA Resolution	Sector
Focusing	LARRD Resolution

Students may turn in **TYPED** definitions for extra credit assignment.

Please do your own work. Definitions must be complete in order to count as extra credit.

Unit 2 Assignment – Mind Map each chapter due for a grade in the class, as instructed.

UNIT III OBJECTIVES

Upon completion of this unit, the student will be able to:

1. define the components of a pulsed echo instrument.
2. list and define pulse modes.
3. understand receiver functions.
4. understand output power vs. receiver gain.
5. review display components.
6. understand concepts of image processing.
7. list types of storage media.
8. define the Doppler effect.
9. understand and correct aliasing.
10. list the differences between PW and CW.
11. define color Doppler and be able to distinguish color maps.
12. review Doppler displays.
13. determine the direction of flow given a color image.
14. adjust control settings to optimize images.

Key Words - Know Definition as it Relates to Ultrasound including: definition, formula, units, typical value, what determines it, can it be changed, how is it changed, significance.

Pulsar	Bit
Receiver	Pre/Post Processing
Display	Read Magnification
Storage	Write Magnification
Master Synchronizer	Dynamic Range
Continuous Wave	Doppler Effect
Pulsed Wave	Velocity
Amplification	Uni-Directional Doppler
Compensation	Bi-Directional Doppler
Compression	Range Ambiguity
Demodulation	Range Specificity
Rectification	Aliasing
Smoothing	Niquist Limit
Reflection	Cosine Angle
Dynamic Range	Color Flow Doppler
Output	Velocity Mode
Gain	Variance Mode
CRT	Turbulence
Bistable	Laminar
Gray Scale	Wall Filter
Analog	Packet
Digital	Spectral Analysis
Scan Converter	Fast Fourier Transform
Pixel	Autocorrelation

Students may turn in **TYPED** definitions for extra credit assignment. Please do your own work. Definitions must be complete in order to count as extra credit.

Unit 3 Assignments

1. Unit 3 Assignment – REVIEW AIT questions at www.ardms.org
 - a. Define the following terms: AIT, SIC, Hot Spot Question
 - b. Write a paragraph explaining the purpose/intent of these new types of questions
 - c. Give three examples of how the SIC will be used to test you.
 - d. What kind of knowledge will you need to successfully answer these types of questions?
Be specific and detailed.
2. Mind Map each chapter due for a grade in the class, as instructed.

UNIT IV OBJECTIVES

Upon completion of this unit, the student will be able to:

1. list the type of artifacts, what causes them and how to correct the problem.
2. know what Quality Assurance is and why it is performed.
3. understand how QA is accomplished, using test objects and phantoms.
4. know what causes Bioeffects, and how to limit the effects.
5. identify the performance characteristics which are measured during QA.
6. list the devices used for testing various aspects of the ultrasound system.
7. differentiate between types of bioeffects.
8. state the AIUM guidelines for intensity limits and prudent use of ultrasound.
9. list special circumstances when ultrasound should be with-held.
10. state the SDMS position on the following: student scanning, screening, non-medical use of US.

Key Words - Know Definition as it Relates to Ultrasound including: definition, formula, units, typical value, what determines it, can it be changed, how is it changed, significance.

Reverberations	Range Accuracy
Shadowing	Calibration
Enhancement	Uniformity
Mirror Image	Hydrophone
Foreground	Radiation Force
Side Lobes	Acoustic Optics
Grating Lobes	Calorimeter
Slice Thickness	Thermocouple
Multipath	Crystals
Beam Profiler	Dosimetry
A.I.U.M.	Mechanistic Approach
Dead Zone	Empirical Approach
Registration Accuracy	Thermal Index
Phantom	Cavitation Normal, Transient, Stable, Inertial
Sensitivity	Mechanical Index

Students may turn in **TYPED** definitions for extra credit assignment. Please do your own work. Definitions must be complete in order to count as extra credit.

Unit 4 Assignments:

1. Internet Assignment – Go to the AIUM and SDMS web sites and review current position statements regarding the use and safety of ultrasound. If there are any NEW standards compared to what is in your book, print them out. Due on the day of the Unit 4 Exam
2. Mind Map each chapter due for a grade in the class, as instructed. ***This last mind map is a “Free Mind Map”*** meaning you can do whatever you like: linear notes, power points, flash cards, or whatever your heart’s desire but it must still include color and visuals and be presented to the class. Due the week before the Unit 4 exam
3. Artifact – Find **at least two artifacts** in an image and print it out or insert it into a power point. Complete the following: Identify it, label it, define it, state the physics of it, state if it is diagnostic or not, state if you would try to remove it or not and if so HOW? Due on the day of the Unit 4 exam.

Extra Credit Assignment: Type up a chart of the **color and Doppler settings** used on an ultrasound system. Include why it is used by the sonographer, how it is set by the sonographer for echo and vascular and what it does (physics behind how the machine accomplishes it). How they are set is not “By a knob on the machine” explain how you know if it is set too high or too low. Include the following for **BOTH Color Doppler and Spectral Doppler** each: gain, scale, baseline, filter, priority, packet size, pre and post processing, ROI/gate, color Doppler frequency (not 2D frequency and not PRF), angle.

Due on the day of the Unit 4 Exam

STUDENT INFORMATION SHEET

NAME _____

Home Phone # _____

Work Phone # _____

Pager/Cell # _____

FAX # _____

Email Address _____ (please print legibly)

Home Address _____
(Street) (City) (Zip Code)

Work Facility _____

Work Address _____

Your Background, i.e., Credentials _____

Addition Information _____

How did you hear about this class? _____

_____ **Yes**, I would like my
information on the
roster.

_____ **No**, Please do not
include my information
on the roster.

PLEASE RETURN COMPLETED FORM TO YOUR INSTRUCTOR!

Ultrasound Physics
Instrumentation Lab Practical

Student Name: _____

Instructor: _____

Date: _____

Machine: _____

Grade: _____

Grading System: S=Satisfactory, NI=Needs Improvement, U=unsatisfactory, N/A

Start with 100% and deduct one for each NI or U.

Mid –term: Be able to locate the following by mid-term.

PWR ON/OFF, Pt ID: _____	Transducer select: _____
Application select: _____	Rev exam, delete clips _____
Transducer Freq: _____	Receiver gain _____
Compress: _____	TGC's _____
Smoothing: _____	Pre-Processing: _____
Post-Processing: _____	TV/Monitor controls: _____
Output power: _____	Depth: _____
Sector width: _____	Image steering: _____
L-R, U-D invert: _____	Zoom/Res: _____
Printer controls: _____	Physio and controls: _____
Annotate: _____	Msrmt calipers trace: _____
Menu – analysis _____	Menu – set up: _____
Msrmt calipers dist: _____	Freeze/Scroll: _____
Filters: _____	Power Down process: _____
Restart or Modify _____	Cursor: _____
Change out probes _____	Image/ref size _____
Digital Acquisition _____	Reports review _____
Archive Review _____	Deleting Archive _____
Sending to Ultraling _____	Reviewing Ultraling _____

Final: Be able to locate the following by end of semester.

Color on, map, scale _____	Color gain, filter _____
Color ROI, size, location _____	Color invert, baseline _____
Color packets, proc _____	Doppler/Color Invert _____
Color/Doppler steering _____	Doppler on, scale _____
Doppler baseline _____	Doppler processing _____
PW, CW, update _____	Harmonics on/off _____
Doppler gate, angle _____	Pedoff probe _____
Doppler volume _____	Sweep speed _____
MMode on/off _____	MMode gain/proc _____
Dual screen _____	Frame Rate display _____
Technical support # _____	User's Manual _____